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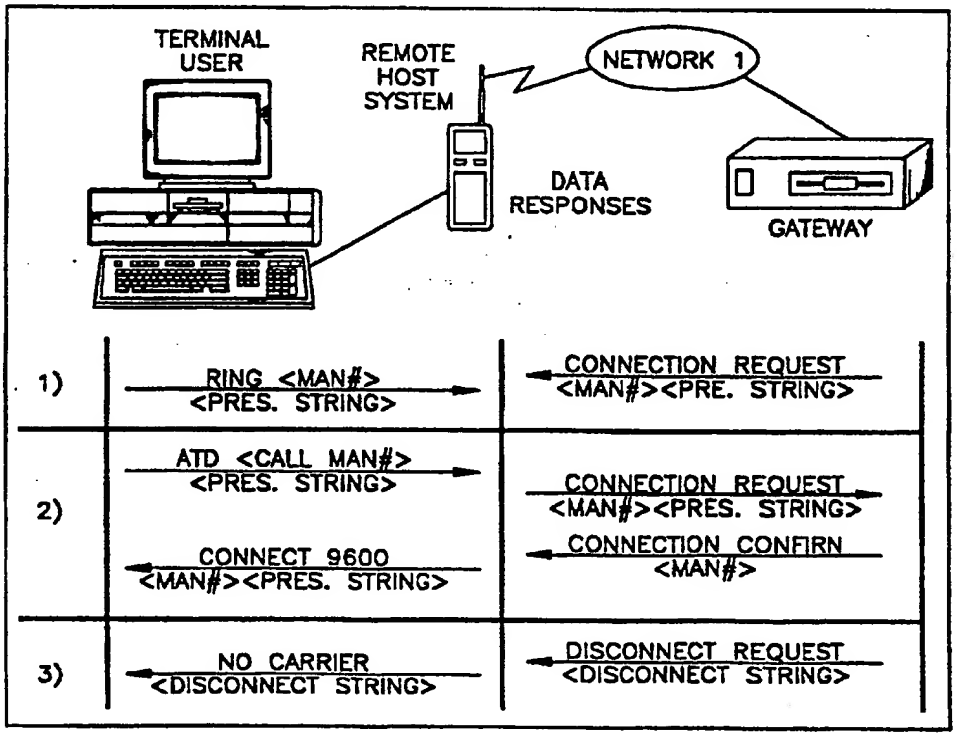
(57) Abstract

The present invention provides a method for enhancing service signals transmitted by a DCE, such as a Modem, to a DTE user. Since any transmission from a remote computer to a DTE user through a wireless communication network can be encoded with additional information, use of an AT compatible modem in conjunction with a wireless communication network adds a new dimension of information that can be displayed to the DTE user. The present invention also includes a method for ensuring effective data transfer from a DCE to a DTE user. When a DTE receives a connection service signal it will often require several internal adjustments before it can accept data. Because data received by a radio-based modem is received in packets, under certain conditions data will be waiting to be transmitted to the user immediately after the modem enters a data transfer state. The method of this invention includes the steps of transmitting a service signal to the DTE indicating that the modem has entered a data transfer state and delaying for a predetermined time after transmitting the data-transfer-state signal before transmitting data from the modem to the DTE.



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COMPUTER SYSTEM FOR USE WITH A WIRELESS DATA COMMUNICATION NETWORK

BACKGROUND OF THE INVENTION

This invention relates generally to the art of connecting data terminal equipment (DTE) users to remote computer systems (or hosts) through a wireless or radio wave data communication network. The invention disclosed may, however, be useful for other forms of data transmission and communication systems.

Over the past several decades, various communication networks have evolved to meet the growing need for access to information. Among the more familiar types of systems used for communication are wire-based telephone communication systems that use physical wires or optical fiber links to connect users. Data transmission using wire-based telephone communication systems can be accomplished using existing AT Modem technology. An AT Modem is a standard data communication equipment (DCE) connection device used with telephone equipment for converting or modulating an asynchronous stream of data into a phone line carrier signal. The connection between an AT Modem and a DTE, such as a personal computer or a portable computer, is usually through an RS-232 interface. One of the principal disadvantages of a wire-based telephone communication network is that users are limited to specific locations where wired connections are available. Another disadvantage is that wire-based telephone communication networks

usually require dedicated telephone lines, which can be expensive.

Recently wireless data communication networks have emerged that enables information exchange by sending and receiving data through high frequency radio signals. Examples of such networks include the Mobitex Radio Network (Mobitex), which is operated by RAM Mobile Data, and Ardis, which is a joint venture of Motorola and IBM. Mobitex was developed in Sweden by Ericsson/Eritel and has been installed and is maintained in many other countries. For example, in Canada, Mobitex is operated by Roger's Cantel. Making efficient use of these wireless data communication networks to connect DTE users to remote computer systems is one of the objects of this invention.

Electronic data communication is organized into networks that have established protocols and specifications. Communication between computers takes place over a connection that is established using a common protocol. A data communication network generally refers to a collection or grouping of computers organized for co-operative communication of data. Once a connection is established, there are a number of data transfer methods used by various data communication networks. Both Mobitex and Ardis use packet switched data transfer methods, which aggregate data into blocks called packets before it is transmitted.

Ericsson also manufactures a device called a Mobidem, which is a radio based modem that is capable of transmitting digital information across the Mobitex data communication network. A Mobidem essentially provides an interface between a DTE user and Mobitex. Unfortunately, effective communication

between a DTE user and a remote computer system across a wireless communication network, such as Mobitex, requires significant enhancements to support the standard AT Modem protocol. An object of this invention is to provide an enhanced user interface to a wireless data communication network such as Mobitex that is compatible with standard AT Modem technology.

A standard AT compatible modem is capable of sending a number of service signals to its DTE user that indicate changes in the status of the modem. For example, if the user makes a call to a remote computer system, several possible events may occur that result in associated service signals:

- if the modem is disconnected, the message "No Carrier" will be displayed;
- if a connection is made, the message "Connect 2400" will be displayed; and
- if the call is made and the remote computer does not answer, "Busy" or "No Answer" will be displayed.

These messages can handle all of the events that can occur in the operation of a land-line modem (i.e. one that uses telephone lines).

The user of the modem has the option of setting various AT Modem parameters that affect whether service signals are transmitted by the modem to the DTE and the form in which they are transmitted. If the user enables the modem to transmit text service signals, the messages noted above will be transmitted to the DTE for display. If the user enables the modem to transmit numeric messages, the modem will transmit a numeric code to the DTE that corresponds to the event that occurred. If user does not enable the modem to transmit service

signals, service signals will not be transmitted to the DTE.

Since any transmission from a remote computer to a DTE user through a wireless communication network such as Mobitex can be encoded with additional information, use of an AT compatible modem in conjunction with Mobitex adds a new dimension of information that can be displayed when an event occurs. An object of this invention is to enhance an AT compatible modem to transmit service signals that include information such as the identity of the caller and a presentation string.

All AT Modems have two basic states of operation; a command state and a data transfer state. In the command state, the DTE user can send command signals to the modem and change the modem's operating parameters. At start-up, an AT Modem is in the command state. When a connection is established, an AT Modem automatically shifts to the data transfer state. Because data received by a radio-based modem such as a Mobidem is received in packets, under certain conditions data will be waiting to be transmitted to the user immediately after the modem enters the data transfer state. Unfortunately, many DTE user applications will fail if the modem begins transmitting data to the user immediately after the modem transmits an entering-data-transfer-state signal. Another object of this invention is to provide a method for delaying data transmission by the modem to the user for a period of time after the modem has entered a data transfer state.

SUMMARY OF THE INVENTION

The preferred system configuration of the present invention includes use of data terminal equipment (DTE), such as a portable computer, together with data communication equipment (DCE), such as the Mobidem manufactured by Ericsson to communicate with a remote computer system or network. Data transmission between the DTE and the DCE consists of a serial data stream. Preferably, the connection between the DTE and the DCE is RS-232 compatible. The DCE processes the data received from the DTE user, bundles the data into packets and transmits the data packets through a wireless communication network such as Mobitex to a gateway. The gateway receives the data transmitted by the DCE and processes that data so that it is compatible with the X.25 standard for packet network interfaces and can be transmitted to any remote computer system or network as long as that system is X.25 compatible. (Although the preferred system configuration incorporates a gateway that is X.25 compatible, the gateway may be configured so that it is compatible with any standardized protocol.)

In a similar fashion, using the preferred system configuration, any remote computer system that is X.25 compatible can transmit information to a DTE user. The remote computer transmits the information in X.25 data packets to the gateway, which disassembles the X.25 data packets and reassembles the data into packets suitable for transmission through a wireless communication network such as Mobitex. The DCE receives the information transmitted through the wireless communication network and processes that information

so that it can be transmitted in a serial data stream to the DTE user.

The present invention provides a method for enhancing service signals transmitted by a DCE, such as a Mobidem, to a DTE user. Since any transmission from a remote computer to a DTE user through a wireless communication network such as Mobitex can be encoded with additional information, use of an AT compatible modem in conjunction with a wireless communication network adds a new dimension of information that can be displayed to the DTE user. The method of the present invention includes the steps of the DCE device receiving a modulated signal from a communication network that includes information such as the source of the signal and may include message data. As noted above, data is transmitted through a wireless communication network such as Mobitex in a data packet that must be disassembled by the DCE for transmission to the DTE user in a serial data stream. The DCE processes the information included in the data packet and, depending on the mode of operation selected by the DTE user, transmits a service signal to the DTE that indicates the source of the data packet and any message data included in that data packet, which is displayed by the DTE to the user.

The method of the present invention uses an AT compatible modem, which includes a receiver for receiving a data packet transmitted through a wireless communication network such as Mobitex. The modem also includes a microcomputer coupled to the receiver for disassembling the data packet and configuring the data into a serial data stream, which, depending on the mode selected by the DTE user, includes information indicating the source of

the data packet and message data, for transmission to the DTE user. As noted above, the connection between the modem and the DTE is preferably an RS-232 interface. The microcomputer is coupled to the RS-232 connection for transmitting the serial data stream to the DTE user. The DTE includes a display for displaying source and message data to the DTE user.

The present invention also includes a method for ensuring effective data transfer from a DCE to a DTE user. When a DTE receives a connection service signal it will often require several internal adjustments before it can accept data. These adjustments may require some amount of time. Because data received by a radio-based modem such as a Mobidem is received in packets, under certain conditions data will be waiting to be transmitted to the user immediately after the modem enters a data transfer state. The method of this invention includes the steps of transmitting a service signal to the DTE indicating that the modem has entered a data transfer state and delaying for a predetermined time after transmitting the data-transfer-state signal before transmitting data from the modem to the DTE. This procedure provides a delay between transmission of a connection service signal and transmission of data by the DCE to allow the DTE sufficient time to make any internal adjustments that may be necessary before it can accept data.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel and useful features of the invention are set forth in the claims. The invention itself, however, as well as specific features and advantages of the invention may be best understood by reference to the detailed description that follows, when read in conjunction with the accompanying drawings.

Figure 1 is a block diagram that illustrates a typical connection between a DTE user and a remote computer system through a wireless data communication network.

Figure 2 is a general block diagram of the basic hardware components of a modem suitable for use with a wireless communication network.

Figure 3 is a block diagram showing the protocol layers involved in establishing and maintaining a connection between a DTE user and a remote computer system through a wireless communication network.

Figure 4 is a state diagram that illustrates the preferred method of enhancing service signals transmitted by a modem to a data terminal equipment user, to include information such as the source of the signal received by the modem and a presentation string.

Figure 5 is a block diagram that shows three examples of enhanced service signals.

Figure 6 is a block diagram showing the structure of the logic design of the preferred method of introducing a connection delay parameter that delays transmission of data from the modem to the terminal equipment user for a predetermined time after transmission by the modem of a connection confirmation message.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 shows the preferred system configuration for use of the present invention. A typical system consists of a DTE 10, such as portable computer, a modem 11 suitable for use with a wireless communication network such as Mobitex Radio Network 12, a gateway 13, for communication between Mobitex 12 and an X.25 network 14, and a remote computer system 15 connected to X.25 network 14. Alternatively, gateway 13 may be connected directly to remote computer system 15, since both are X.25 compatible. In the preferred embodiment modem 11 is a Mobidem, but may be any radio based modem that is capable of transmitting digital information across a wireless data communication network such as Mobitex 12. DTE 10 is physically connected to modem 11 by a standard RS-232 cable 16, which is suitable for bi-directional transmission of serial data. Mobitex 12 is connected to gateway 13 by a leased line, and gateway 13 is connected to X.25 Network 14 by a synchronous modem (not shown). Also, in the preferred embodiment, gateway 13 is a RIMGATE available from Research In Motion of Waterloo, Canada.

The system configuration illustrated in Figure 1 allows the DTE user to communicate effectively with remote computer system 15. Information is transmitted from DTE 10 to Mobidem 11 as an asynchronous stream of data. Mobidem 11 receives this data, processes it and assembles it into Mobitex data packets (MPAKs), which are suitable for transmission through Mobitex 12. Mobitex 12 receives the MPAKs transmitted by Mobidem 11 and relays those MPAKs to gateway 13. Gateway 13

disassembles the MPAKs and reassembles the data into X.25 data packets that can either be transmitted through X.25 network 14 to remote computer system 15 or, if there is a direct connection between the gateway 13 and the remote computer system 15, transmitted directly to remote computer system 15.

In a similar fashion, remote computer system 15 can transmit information to DTE 10. Remote computer system 15 transmits X.25 data packets to gateway 13, where they are disassembled and reassembled into MPAKs that are transmitted through Mobitex 12 to Mobidem 11. Mobidem 11 disassembles the MPAKs and transmits the data to DTE 10 as a serial asynchronous data stream.

In Figure 1, gateway 13 acts as an intermediate node between Mobitex 12 and X.25 Network 14. Instead of connecting to a remote computer system, a DTE user may communicate with another DTE user by designating that data packets be routed to another Mobidem (not shown). In this way a DTE user can communicate directly with another DTE user through Mobitex 12.

AT Modems have two basic states of operation; a command state and a data transfer state. In the command state, the DTE user can send command signals to modem 11 to set various modem operating parameters and store these parameters in memory. The DTE user sets these parameters by sending control signals across RS-232 cable 16 to modem 11. These parameters may be stored in a memory device, such as an electrically alterable ROM, so that the user's selected operating parameters are not lost if modem 11 is turned off and back on.

One of the operating parameters that can be set by the user of a conventional AT modem is whether

service signals are transmitted to the DTE. A service signal is a simple message that informs the DTE user that the modem has changed state. For example, when a standard AT Modem receives a connection request, it generates a service signal that causes the DTE to display the message "RING". Any transmission routed though a wireless communication network such as Mobitex 12, however, includes certain routing information and can be encoded with additional information that can be used to enhance service signals transmitted to the DTE for display. In accordance with the present invention, the user also has the ability to enable verbose message mode (#V1) and extended verbose message mode (#V2). #V1 and #V2 cause additional information to be included with the service signal displayed to the DTE user. #V1 causes the Mobitex Access Number (MAN) of the calling device to be displayed with the service signal and #V2 causes the MAN number and a presentation string to be displayed with the service signal.

Figure 2 is a general block diagram of modem 11, which is suitable for use with a wireless communication network such as Mobitex 12. As noted above, in the preferred modem 11 for use in accordance the this invention is a Mobidem and DTE 10 is physically connected to Modem 11 by a standard RS-232 cable 16, which is suitable for bi-directional transmission of serial data. This connection to modem 11 is made through a standard RS-232 interface 20. RS-232 interface 20 accepts control signals and serial data transmitted from DTE 10 and relays that information to microcomputer 22 through buffer 21. Buffer 21 stores information received from RS-232 interface 20 until

microcomputer 22 is ready to accept it. Buffer 21 also stores information received from microcomputer 22, which is transmitted to DTE 10 through RS-232 interface 20 when DTE 10 is ready to accept it. Microcomputer 22 contains the logic circuitry and memory required to implement the invention. Microcomputer 22 takes serial data received from buffer 21 and assembles that data into MPAKs for transmission through Mobitex 12. Microcomputer 22 also disassembles MPAKs received from Mobitex 12 and configures that data into a serial data stream for transmission to DTE 10.

Information that has been assembled into MPAKs for transmission through Mobitex 12 is first modulated by modulator/demodulator 23 and then forwarded to radio transceiver 24. From radio transceiver 24, information is transmitted to Mobitex 12 through antenna 25. Transceiver 24 also receives modulated signals through antenna 25 that include information in MPAKs from Mobitex 12. These signals are demodulated by modulator/demodulator 23 and forwarded to microcomputer 22. As noted above, microcomputer 22 disassembles MPAKs received from Mobitex 12 and configures that data into a serial data stream for transmission to DTE 10. Microcomputer 22 also examines these signals for validity and content.

Operation of Mobidem 11 in connection with gateway 13, or in connection with another Mobidem involves several protocol layers. Figure 3 is a detailed illustration of the various protocol layers involved in supporting an end-to-end connection between Mobidem 11 and gateway 13 or another Mobidem. These layers work together as defined by the International Standard's Committee (ISO's) paper

on Open System Interconnect (OSI). Each protocol layer has its own distinct header that enables it to perform its specific protocol functions. The exact format of each protocol, the service definition between the different layers and the function of each protocol is set forth in a series of documents available from Ericsson Sweden and Eritel Sweden including:

a. Mobitex Terminal Specification
001 53-03/L2BA 703 1001
Section: Mobitex Network Layers for Terminals
S/1056-A-296 S171/0 Ue
Eritel AB, Sweden

b. Mobitex Transport Protocol, Release B (MTP/1)
Y/KL-91:754
1/115517-CALA 88215
By: Anders Olsson and Eddie Johansson
Ericsson Mobile Communications AB

c. Mobitex Transport Service Definition
AUR-92:760
By: Anders Olsson
Ericsson Mobile Communications AB

d. MCP/1 Mobitex Compression Protocol
ECS Y/G-93:0242
By: Jack De Winter
Research In Motion, Waterloo, Canada and Ericsson AB, Sweden

e. MCP/1 Mobitex Compression Service Definition
ECS Y/G-93:0241
By: Jack De Winter
Research In Motion, Waterloo, Canada and Ericsson AB, Sweden

As shown in Figure 3, adjacent layers make use of lower layers for services. The application on both sides of the Mobitex connection makes use of the session interface to access a range of session services. Examples of these services include:

Session Open (Accept) Connection, Session Close Connection and Session Send Data. The function of these services include opening a session, closing a session and sending data through a session. Each of these services is completely defined by the MCP/1 specifications referenced above.

The Session layer makes use of the transport interface to access a range of transport services, including, Transport Open Connection, Transport Close Connection and Transport Send Data. The function of these services is to open a transport connection, close a transport connection and send data through a transport connection. Each of these services is completely defined by the MTP/1 specifications referenced above. The transport layer interfaces with the network layer and makes use of the network layer for services. The object of the transport layer is to guarantee the delivery of data.

The transport layer makes use of the Network layer for network services. The basic function of the Network layer is to build and interpret MPAKs. The radio protocol layers implement ROSI and GMSK, which perform the modulation/demodulation required to convert data into the RF format used by Mobitex. ROSI is a method used to place data into small packets for transmission. GMSK stands for Gauss Mean Shift Keying and is simply a modulation technique used for modulating FM data on a radio signal.

Establishing and maintaining a connection between Mobidem **11** and gateway **13** through Mobitex **12** involves each of the protocols shown in Figure 3. For example, as data arrives into Mobidem **11** from Mobitex **12**, it is passed through Radio layers **30** to

the to Network layer 21. Data arrives at Network layer 31 in MPAKs, where is checked to make sure that data has arrived in the correct format and then passed to Transport layer 32. The MTP/1-based Transport layer 32 looks at the MTP/1 message type, found in the first three bytes of the message, also called the message header, to determine how to process the MTP/1 message. Protocol messages exchanged between different Transport layers are called Transport Protocol Data Units (TPDUs) and follow the format documented in the MTP/1 specification referenced above. After Transport layer 32 has decoded the TPDU, it passes the message up to Session layer 33 as a session message. Protocol messages exchanged between different Session layers are called Session Protocol Data Units (SPDUs) and follow the format documented in the MCP/1 specification referenced above. Session layer 33 interfaces with Application 34.

Figure 4 is a state diagram that illustrates the preferred method of enhancing service signals transmitted by a modem to a DTE user. For example, to establish a connection with Mobidem 11, gateway 13 sends an MPAK through Mobitex 12 that includes a connection request. Each MPAK includes a source and destination Mobitex Access Number (MAN) that is used by Mobitex for routing and billing purposes. As noted above, as data arrives into Mobidem 11 from Mobitex 12, it is passed through the Radio layers to the to Network layer 31, functionally represented by block 41. At network layer, when Mobidem 11 receives a valid MPAK, it takes out the MAN number and hands this information along with any data present in the MPAK to Transport layer 32, functionally represented by block 42. The transport

layer, interprets the TPDU, to determine how to process it. If the TPDU is a connection request (CR), Transport layer 32 opens a transport connection and marks it as 'opening' and passes the CR to Session layer 33. If the TPDU is a connection confirmation (CC), Transport layer 32 looks for a transport connection that is in the 'opening' state, marks it as 'opened' and passes the CC message to Session layer 33. If the TPDU is a disconnect request (DR) it looks for a transport connection that is in the 'opened' state or the 'opening' state, removes the connection from the list of open connections, and passes the DR up to Session layer 33. (The MTP/1 specification referenced above lists other messages that may be encountered by the transport layer.) Transport layer 32 also converts the MAN numbers received from Network layer 31 into Transport Service Access Points (TSAPs), which are also passed up to Session layer 33. A TSAP is simply the MAN numbers with a 4 bit identification code attached. defined in the MTP/1 specification. The message, TSAP and any other data received from Network layer 32 is passed up to the session layer as a Session SPDU, block 43.

Session layer 33, examines the SPDU received from Transport layer 32 to determine the content of the SPDU and to check to see if a presentation string is present, block 44. If a presentation string is present, the session layer extracts the presentation string from the SPDU, block 45. The SPDU from the transport layer should match the current state of the session layer. If the SPDU is a CR, the session layer 33 checks to see if a connection with the same TSAP exists and if not opens the connection. If the SPDU is a CC or a DR,

the session layer scans its list of connections for a connection already open to the same TSAP. Once the session layer has performed its tests and verified the SPDU, it converts the TSAP to a Session Service Access Point (SSAP) as required by the MCP/1 specification referenced above. The SPDU, presentation string and SSAP are then passed to the Application 34 as a Session Request, block 46.

After Application 34 receives the Session Request, it determines whether it is a valid request as illustrated by blocks 47-49. At block 47, if the Session Request is a CR, the application checks to ensure that a connection is not already opened or pending; At block 48, if the Session Request is a CC, the application verifies that it has made a CR. At block 49, if the Session Request is a DR, the application verifies that a full connection is currently open. When a match is reached, the application determines the type of service signal that will be transmitted to the DTE user, block 50.

Before the service signal is sent to the DTE user, the application checks to determine whether the user has selected verbose message mode and extended verbose message mode. If the setting #V1 is detected, block 51, the MAN number of the calling device is included with the standard service signal, block 52. Application 34 extracts the calling MAN number from the SSAP by deleting the four bit identification code and using the MAN number from the SSAP data structure that corresponds to the calling device. If the setting #V2 is detected, the presentation string is added to the service signal and the MAN number, block 53. Finally the application sends the enhanced service signal to the DTE user over RS-232 interface, block 54.

Figure 5 is a block diagram that shows three examples enhanced service signals. Example 1 is an illustration of gateway 13 accessing modem 11, which is essentially the same as the example discussed in connection with Figure 4.

In example 2, the DTE user requested a connection to a given MAN using a standard AT Modem Dial command. As noted above, a full connection sequence, as defined by MTP/1 and MCP/1 is a two step process. It involves a CR followed by a CC. These are symmetrical messages and they contain same information as for the application is concerned. Therefore it is possible to include a presentation string on the CR and the CC messages that are exchanged between the session and application layers. When a connection is accepted, a CC returns from the gateway. In the example, if the DTE user has enabled extended verbose messages, the standard service signal "Connect 9600" will be extended to include the MAN number of the gateway and a presentation string if provided by the gateway.

In example 3, the gateway has initiated a disconnect and included a disconnect string. A disconnect could occur if the remote computer system abruptly disconnected the DTE user, of the CR failed. If the DTE user has enabled extended verbose messages, the DTE user can see the disconnect string attached to the standard service signal "No Carrier".

Figure 6 is a block diagram that illustrates the structure of the logic design of the preferred method of introducing a connection delay parameter that delays transmission of data from modem 11 to DTE 10 for a predetermined time after transmission by modem 11 of a connection confirmation signal.

The logic conceptually begins at block 60 when a connection is established between modem 11 and remote computer system 15. When modem 11 receives a connection confirmation signal from remote computer system 15 it enters a connected state 60 and then proceeds to block 61, where it generates a service signal that notifies DTE 10 that a connection has been established. After sending the connection service signal, modem 11 proceeds to block 62, which recalls the value of the connection delay parameter selected by the user, and then to block 63, which initiates a timer. Block 64 compares the value of the timer to the value of the connection delay parameter. When the value of the timer exceeds the value of the connection delay parameter, modem 11 drops down to block 65 and begins sending data to DTE 10. This procedure provides a delay between transmission of a connection service signal and transmission of data by DCE 11 to allow DTE 10 sufficient time to make any internal adjustments that may be necessary to accept data from DCE 11. The preferred embodiment also provides a mechanism to allow the DTE user to set the duration of the delay to accommodate various DTE equipment and configurations.

While the invention has been described in connection with a preferred embodiment, it is not intended to limit the scope of the invention to the particular form set forth, but, on the contrary, it is intended to cover such alternatives, modifications, and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

CLAIMS

1. A method of enhancing service signals transmitted by a data communication equipment (DCE) to a data terminal equipment (DTE) user, comprising the steps of:

receiving a modulated signal by a DCE from a communication network; and

transmitting a service signal from the DCE to the DTE indicating the source of the modulated signal received by the DCE.

2. The method of claim 1, including the step of displaying to the DTE user the source of the modulated signal received by the DCE.

3. The method of claim 1, wherein the DCE is a modem.

4. The method of claim 1, wherein the communication network is a wireless communication network.

5. The method of claim 1, wherein the service signal transmitted by the DCE to the DTE includes message data transmitted by the initiator of the modulated signal.

6. The method of claim 5, including the step of displaying to the DTE user the message data transmitted by the initiator of the modulated signal.

7. The method of claim 5, wherein the DTE user selects the information included in the service signal transmitted by the DCE to the DTE.

8. A method of enhancing service information transmitted by a modem to a data terminal equipment (DTE) user, comprising the steps of:

receiving a modulated signal by a modem that includes at least one data packet from a communication network;

demodulating the modulated signal and disassembling the data packet; and

transmitting a service signal that identifies the initiator of the modulated signal received by the modem.

9. The method of claim 8, including the step of displaying to the DTE user the identity of the initiator of the modulated signal received by the modem from the communication network.

10. The method of claim 8, wherein the communication network is a wireless communication network.

11. The method of claim 8, wherein the service signal transmitted by the modem to the DTE includes message data transmitted by the initiator of the modulated signal received by the modem from the communication network.

12. The method of claim 11, including the step of displaying to the DTE user the message data transmitted by the initiator of the modulated signal received by the modem from the communication network.

13. The method of claim 12, wherein the DTE user selects the information included in the service signal transmitted by the modem to the DTE.

14. A modem for receiving data from a wireless communication network and transmitting said data to a data terminal equipment (DTE) user, the modem including:

a receiver for receiving a modulated signal that includes at least one data packet from the wireless communication network;

a demodulator coupled to the receiver for demodulating the modulated signal;

a microcomputer coupled to the demodulator for disassembling the data packet and configuring said data into a service signal that includes the identity of the initiator of the modulated signal; and

an RS-232 interface coupled to the microcomputer for transmitting the service signal to the DTE user.

15. The modem of claim 14, wherein the service signal includes message data transmitted by the initiator of the modulated signal.

16. The modem of claim 15, wherein the microcomputer includes means for selecting the information included in the service signal transmitted by the modem to the DTE user.

17. A data communication equipment (DCE) for receiving data from a communication network and transmitting said data to a data terminal equipment (DTE) user, the DCE including:

a receiver for receiving a modulated signal that includes at least one data packet when an event occurs to the connection between the DCE and the communication network;

a demodulator coupled to the receiver for demodulating the modulated signal;

a microcomputer coupled to the demodulator for disassembling the data packet and configuring said data into a serial data stream that includes information identifying the initiator of the modulated signal received from the communication network; and

an RS-232 interface coupled to the microcomputer for transmitting the serial data stream to the DTE user.

18. The DCE of claim 17, wherein the serial data stream includes message data transmitted by the initiator of the modulated signal.

19. The DCE of claim 18, wherein the microcomputer includes means for selecting the information included in the serial data stream transmitted by the DCE to the DTE user.

20. A method of enhancing service signals transmitted by a data communication equipment (DCE) to a data terminal equipment (DTE) user, comprising the steps of:

receiving a modulated signal from a communication network to the DCE when an event occurs to the connection between the DCE and the communication network; and

transmitting a signal from the DCE to the DTE indicating the source of the modulated signal received by the DCE.

21. The method of claim 20, wherein the communication network is a wireless communication network.

22. The method of claim 20, wherein the signal transmitted by the DCE to the DTE includes message data transmitted by the initiator of the modulated signal.

23. A method of enhancing service signals transmitted by a data communication equipment (DCE) to a data terminal equipment (DTE) user, comprising the steps of:

receiving a data packet by the DCE from a communication network; and

transmitting a service signal from the DCE to the DTE indicating the source of the data packet received by the DCE from the communication network.

24. The method of claim 23, including the step of displaying to the DTE user the source of the data packet received by the DCE.

25. The method of claim 23, wherein the DCE is a modem.

26. The method of claim 23, wherein the communication network is a wireless communication network.

27. The method of claim 23, wherein the service signal transmitted by the DCE to the DTE includes message data transmitted by the initiator of the data packet.

28. The method of claim 27, including the step of displaying to the DTE user the message data transmitted by the initiator of the data packet.

29. The method of claim 23, wherein the DTE user selects the information included in the service signal transmitted by the DCE to the DTE.

30. A data communication equipment (DCE) for receiving data from a communication network and transmitting said data to a data terminal equipment (DTE) user, the DCE including:

a receiver for receiving a data packet from the communication network;

a microcomputer coupled to the receiver for disassembling the data packet and configuring said data into a service signal that includes the identity of the initiator of the data packet received from the wireless communication network; and

an RS-232 interface coupled to the microcomputer for transmitting the service signal to the DTE user.

31. The DCE of claim 30, wherein the service signal includes message data transmitted by the initiator of the data packet.

32. The DCE of claim 31, wherein the microcomputer includes means for selecting the information included in the service signal transmitted by the DCE to the DTE user.

33 The DCE of claim 30, wherein the communication network is a wireless communication network.

34. A method of ensuring effective data transfer from a data communication equipment (DCE) to a data terminal equipment (DTE) user, comprising the steps of:

transmitting a signal from the DCE to the DTE indicating that the DCE device has entered a data transfer state; and

delaying for a predetermined period of time after transmitting said signal before transmitting data from the modem to the DTE.

35. The method of claim 23, wherein the predetermined period of time is set by the user of the DTE.

36. A modem for operating in either a data transfer state or a command state, the modem including:

a receiver for receiving a modulated signal from a communication network;

a demodulator coupled to the receiver for demodulating the modulated signal;

a microcomputer coupled to the demodulator for disassembling the data packet and

configuring said data into a serial data stream;

delay means for transmitting said serial data stream to the DTE a predetermined period of time after entering the data transfer state; and

an RS-232 interface coupled to the microcomputer for transmitting the serial data stream to the DTE user.

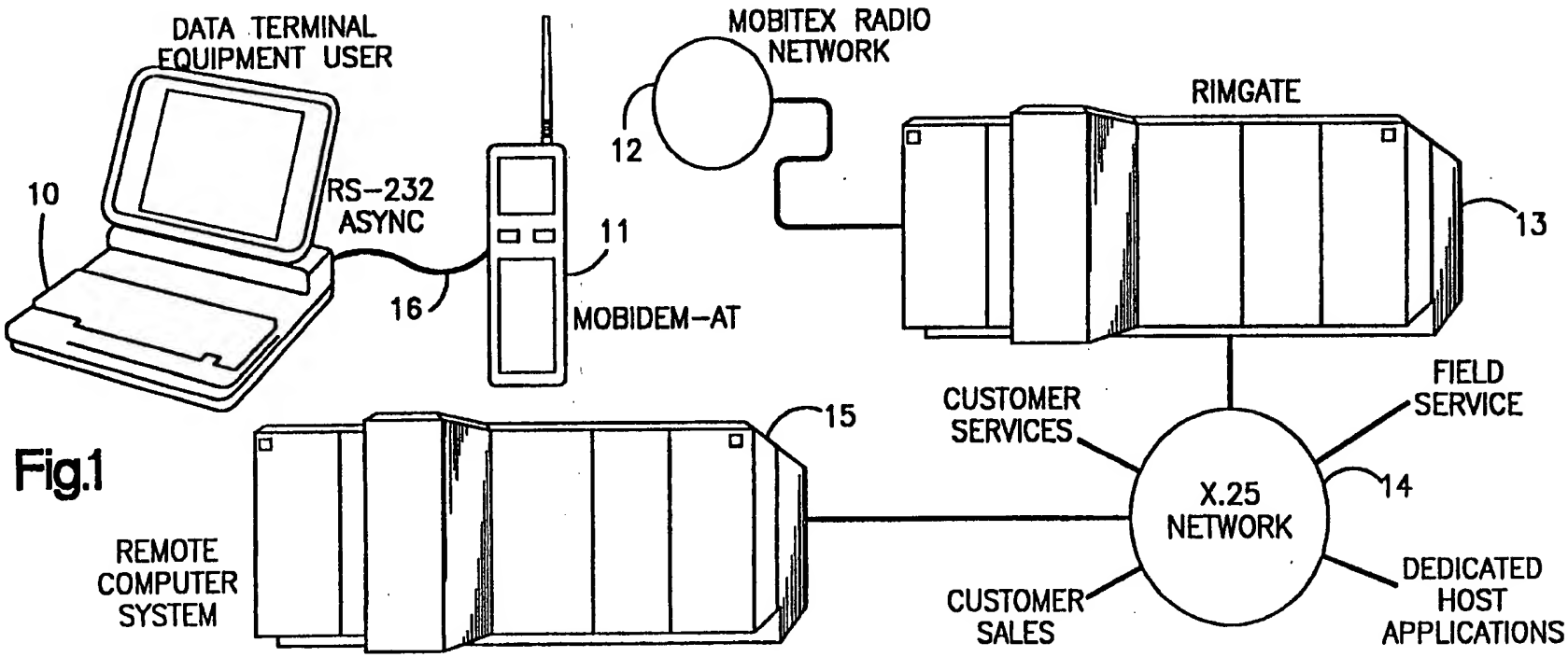
DATA TERMINAL EQUIPMENT USER
10
RS-232 ASYNC
16
11
MOBIDEM-AT
12
MOBITEX RADIO NETWORK
RIMGATE
13
15
REMOTE COMPUTER SYSTEM
CUSTOMER SERVICES
FIELD SERVICE
X.25 NETWORK
14
CUSTOMER SALES
DEDICATED HOST APPLICATIONS

Fig.1

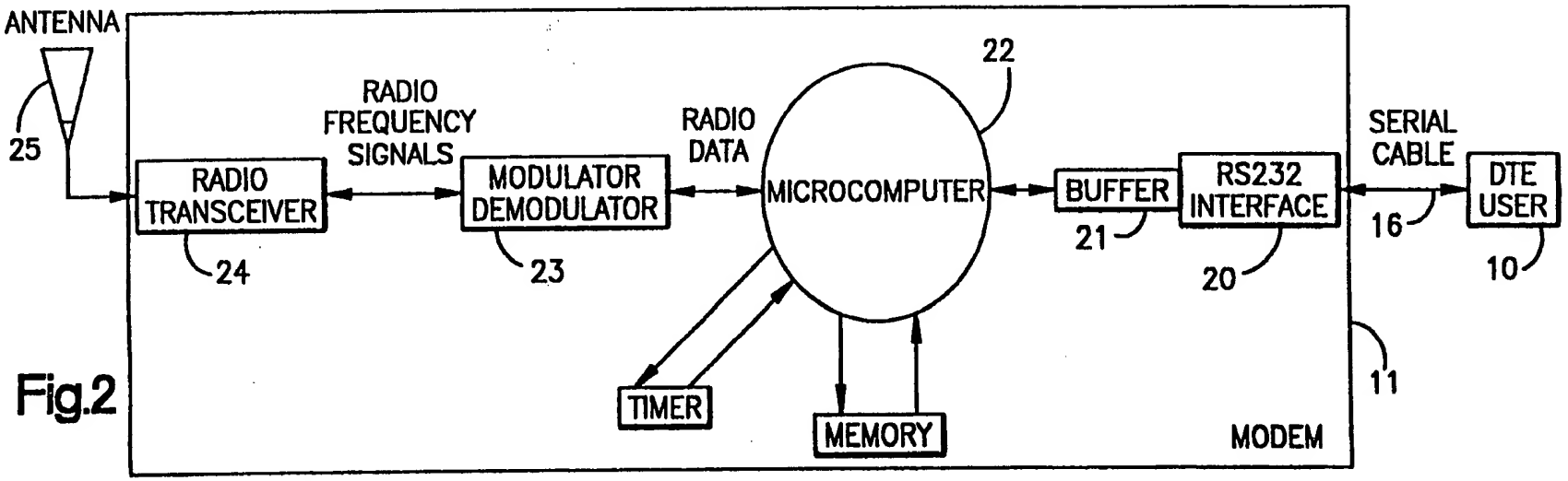
ANTENNA
25
RADIO TRANSCEIVER
24
RADIO FREQUENCY SIGNALS
MODULATOR DEMODULATOR
23
RADIO DATA
22
MICROCOMPUTER
TIMER
MEMORY
BUFFER
21
RS232 INTERFACE
20
SERIAL CABLE
16
DTE USER
10
11
MODEM

Fig.2

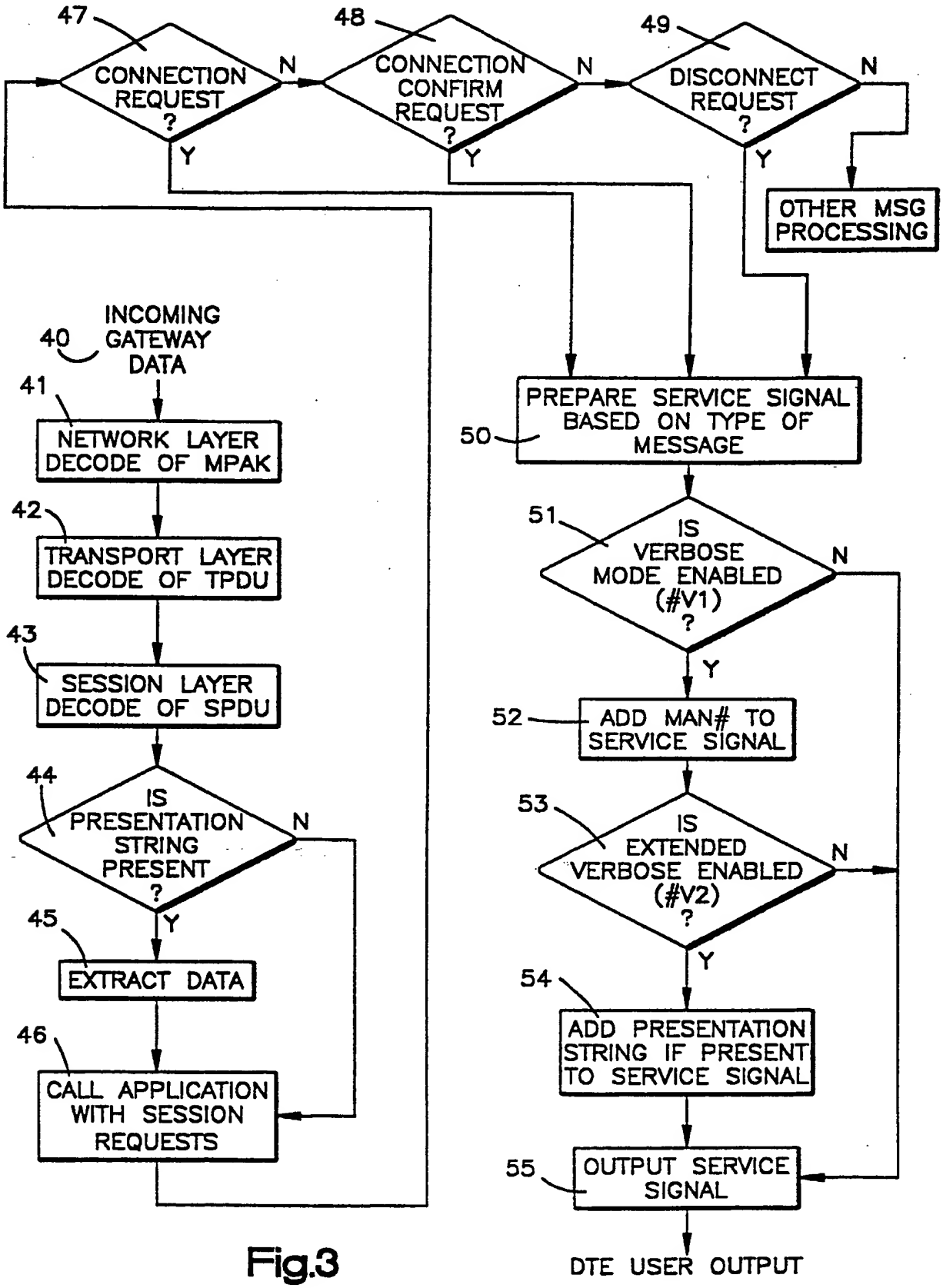
47
CONNECTION REQUEST ?
N
Y
48
CONNECTION CONFIRM REQUEST ?
N
Y
49
DISCONNECT REQUEST ?
N
Y
OTHER MSG PROCESSING
INCOMING GATEWAY DATA
40
41
NETWORK LAYER DECODE OF MPAK
42
TRANSPORT LAYER DECODE OF TPDU
43
SESSION LAYER DECODE OF SPDU
44
IS PRESENTATION STRING PRESENT ?
N
Y
45
EXTRACT DATA
46
CALL APPLICATION WITH SESSION REQUESTS
PREPARE SERVICE SIGNAL BASED ON TYPE OF MESSAGE
50
51
IS VERBOSE MODE ENABLED (#V1) ?
N
Y
52
ADD MAN# TO SERVICE SIGNAL
53
IS EXTENDED VERBOSE ENABLED (#V2) ?
N
Y
54
ADD PRESENTATION STRING IF PRESENT TO SERVICE SIGNAL
55
OUTPUT SERVICE SIGNAL
DTE USER OUTPUT

Fig.3

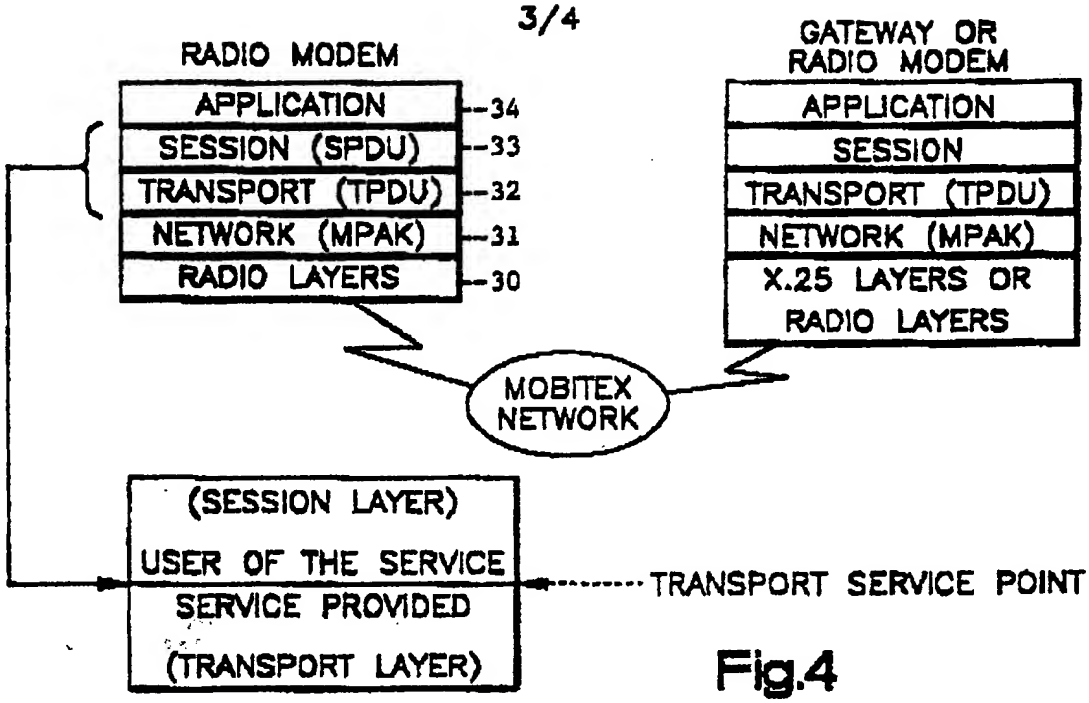
RADIO MODEM
APPLICATION
SESSION (SPDU)
TRANSPORT (TPDU)
NETWORK (MPAK)
RADIO LAYERS
34
33
32
31
30
GATEWAY OR RADIO MODEM
APPLICATION
SESSION
TRANSPORT (TPDU)
NETWORK (MPAK)
X.25 LAYERS OR RADIO LAYERS
MOBITEX NETWORK
(SESSION LAYER)
USER OF THE SERVICE
SERVICE PROVIDED
(TRANSPORT LAYER)
TRANSPORT SERVICE POINT

Fig.4

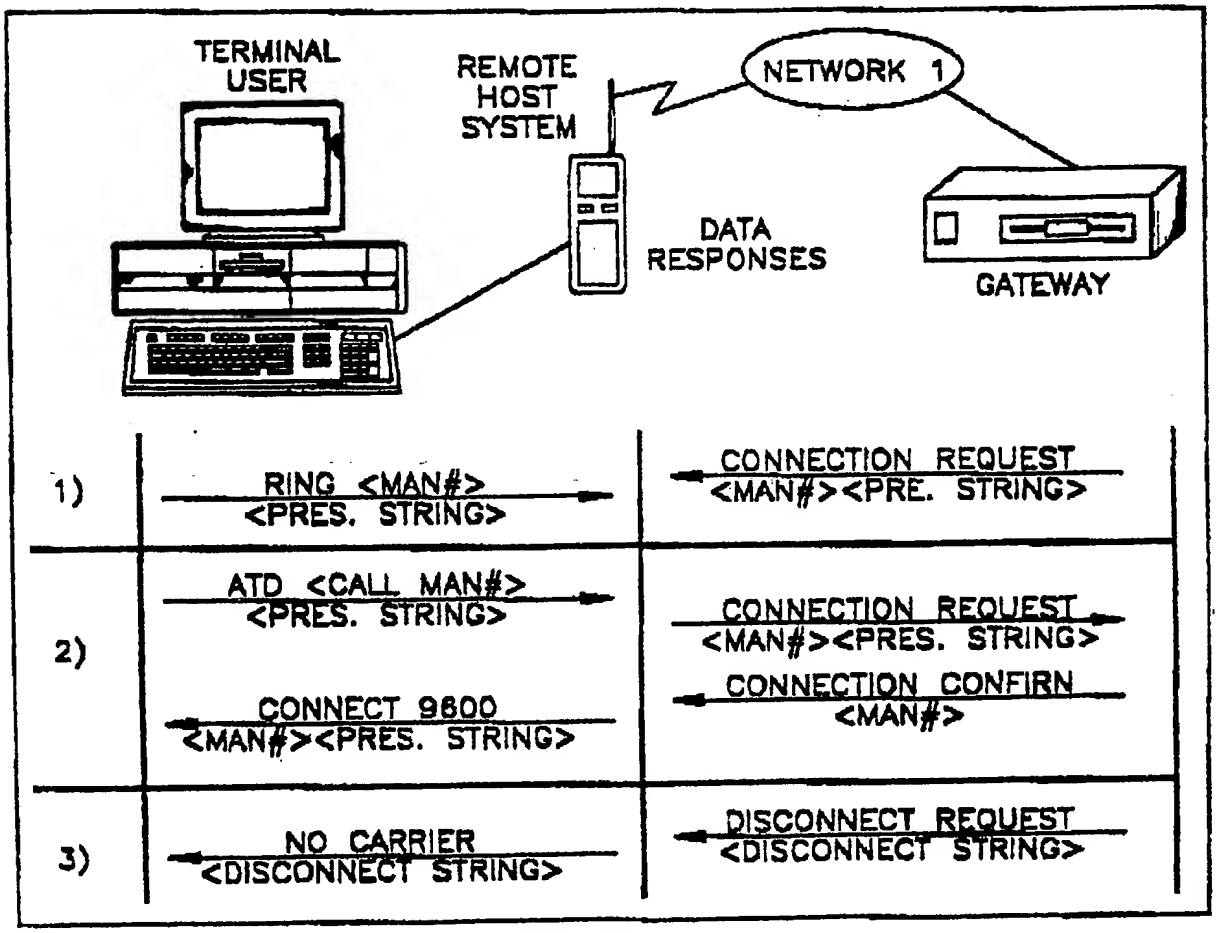
TERMINAL USER
REMOTE HOST SYSTEM
NETWORK 1
DATA RESPONSES
GATEWAY
1)
RING <MAN#> <PRES. STRING>
CONNECTION REQUEST <MAN#><PRE. STRING>
2)
ATD <CALL MAN#> <PRES. STRING>
CONNECTION REQUEST <MAN#><PRES. STRING>
CONNECT 9600 <MAN#><PRES. STRING>
CONNECTION CONFIRN <MAN#>
3)
NO CARRIER <DISCONNECT STRING>
DISCONNECT REQUEST <DISCONNECT STRING>

Fig.5

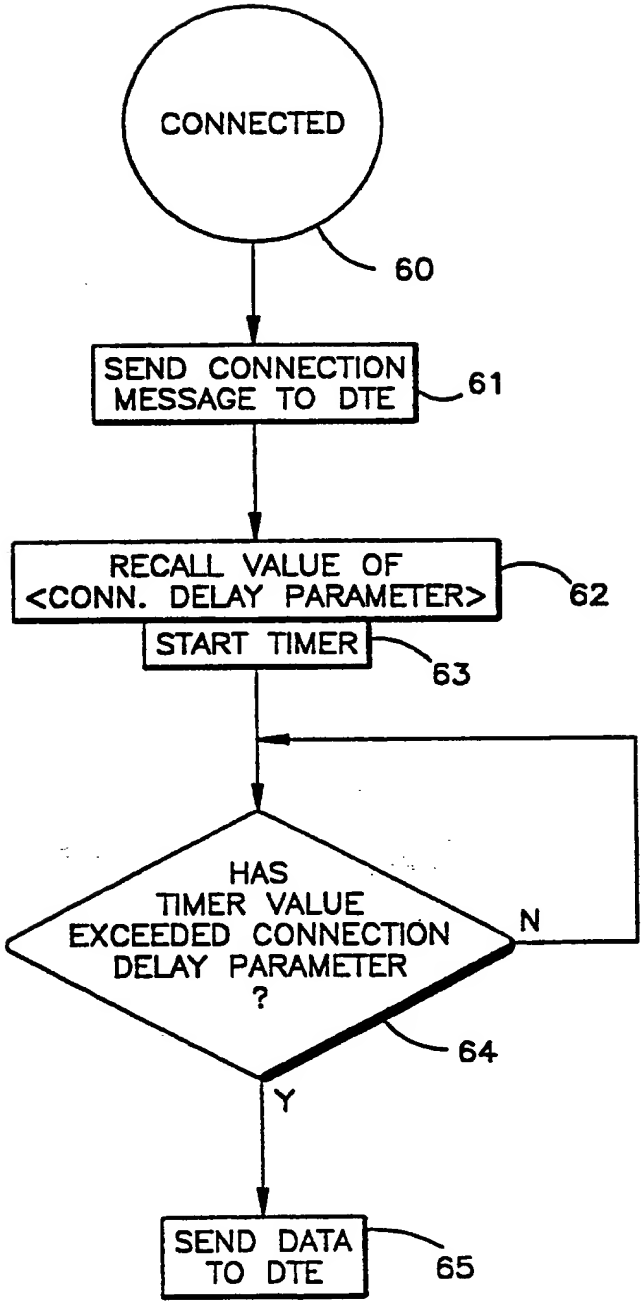
CONNECTED
60
SEND CONNECTION MESSAGE TO DTE
61
RECALL VALUE OF <CONN. DELAY PARAMETER>
62
START TIMER
63
HAS TIMER VALUE EXCEEDED CONNECTION DELAY PARAMETER ?
N
64
Y
SEND DATA TO DTE
65

Fig.6

INTERNATIONAL SEARCH REPORT

International lication No
PCT/CA 94/00471

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04M11/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO,A,91 07044 (INTELLIGENCE TECHNOLOGY CORPORATION) 16 May 1991 see page 11, line 6 - line 11 see page 13, line 20 - page 14, line 17 ---	1-33
Y	US,A,4 776 005 (PETRICCIONE ET AL.) 4 October 1988 see column 1, line 14 - line 51 see column 3, line 18 - line 54 see figures 1-3 ---	1-33
X	EP,A,0 047 833 (INTERNATIONAL BUSINESS CORPORATION) 24 March 1982 see page 2, paragraph 2 see page 3, paragraph 4 - page 5, paragraph 1 --- -/--	34-36

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

2

Date of the actual completion of the international search	Date of mailing of the international search report
1 February 1995	0 9. 02. 95
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Authorized officer Goossens, A

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International dication No
PCT/CA 94/00471

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO,A,90 03076 (INTELLIGENCE TECHNOLOGY CORPORATION) 22 March 1990 see page 1, line 13 - page 2, line 37 see figures 1-3	1-33
A	WO,A,92 10047 (NOKIA MATKAPUHELIMET OY) 11 June 1992 see figure 2	1-33
A	US,A,5 239 385 (EJIRI) 24 August 1993	1,8,14, 17,20, 23,30
A	US,A,3 894 287 (MATHIESEN) 8 July 1975 see the whole document	34-36
A	US,E,RE34034 (O'SULLIVAN) 18 August 1992 see abstract	34-36

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA94/00471

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see Annex

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searches without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/CA 94/00471

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
WO-A-9107044	16-05-91	EP-A-	0450062	09-10-91
US-A-4776005	04-10-88	NONE		
EP-A-0047833	24-03-82	US-A-	4375103	22-02-83
		JP-B-	1012426	28-02-89
		JP-C-	1534373	12-12-89
		JP-A-	57055645	02-04-82
WO-A-9003076	22-03-90	US-A-	4991197	05-02-91
		AU-A-	4310289	02-04-90
		EP-A-	0387338	19-09-90
WO-A-9210047	11-06-92	EP-A-	0606205	20-07-94
		JP-T-	5503411	03-06-93
US-A-5239385	24-08-93	JP-A-	1175354	11-07-89
US-A-3894287	08-07-75	CH-A-	574689	15-04-76
		DE-A-	2417654	31-10-74
		FR-A,B	2225893	08-11-74
US-E-RE34034	18-08-92	US-A-	4697281	29-09-87
		CA-A-	1257655	18-07-89